

Application No. 10/781,226

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IN THE CLAIMS:

1. (previously amended) A method for treating one or more articles with a plasma generated from dissociating one or more gases, said method comprising:

supplying one or more gases from a source to a first chamber, including a means for controlling expansion of a plasma back through said source from said first chamber;

applying RF power to dissociate said one or more gases and create said plasma having a power density;

withdrawing said dissociated one or more gases from said first chamber through at least one constriction, wherein said at least one constriction is sized to increase said power density of said plasma at said at least one constriction; and

supplying said dissociated one or more gases to a second chamber containing said one or more articles.

2. (original) The method of claim 1, wherein a gas mixture is dissociated by the energy in said dissociated one or more gases.

3. (original) The method of claim 1, wherein supplying one or more gases to a first chamber includes using one or more small openings to prevent expansion of said plasma back through said source from said first chamber.

4. (original) The method of claim 1, further comprising:

applying RF power to one or more gases in an additional chamber having a second constriction to dissociate said one or more gases from a second source into a second plasma prior to supplying said second plasma to said second chamber containing one or more articles.

5. (original) The method of claim 1, further comprising:

operating a plurality of plasma sources in parallel, wherein one or more plasma sources of said plurality of plasma sources has at least one constriction with a selected diameter.

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6. (original) The method of claim 1, wherein said at least one constriction is achieved by a removable insert.

7. (original) The method of claim 1, wherein said at least one constriction is achieved by an insert including material chosen to react with said plasma to release one or more elements into said plasma.

8. (previously amended) A method for treating one or more articles with plasma generated by dissociating one or more gases, said method comprising:

supplying one or more gases from a first source to a first chamber;

applying RF power to dissociate said one or more gases from said first source to create a first plasma having a first power density;

withdrawing said first plasma from said first chamber through a first constriction to increase said first power density of said first plasma;

supplying one or more gases from a second source to a second chamber for RF power to dissociate said one or more gases from said second source to create a second plasma having a second power density;

using a second constriction to withdraw said second plasma from said second chamber to increase said second power density of said second plasma; and

supplying said first plasma from said first chamber and said second plasma from said second chamber to a third chamber containing said one or more articles.

9. (original) The method of claim 8, wherein said first chamber and said second chamber are supplying said first plasma and second plasma in parallel to said third chamber.

10. (original) The method of claim 8, wherein said first chamber and said second chamber are supplying said first plasma and second plasma in series to said third chamber.

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11. (original) The method of claim 8, further comprising:

providing a removable insert in at least one chamber to achieve at least one constriction and a higher power density in proximity to said removable insert.

12. (original) The method of claim 8, further comprising:

positioning said first constriction and said second constriction in proximity to each other to enhance said plasma released into said third chamber.

13. (original) The method of claim 8, wherein at least one constriction is achieved by an insert including material chosen to react with said plasma to release one or more elements into said plasma.

14. (currently amended) An apparatus for dissociating one or more gases to produce a plasma, said apparatus comprising:

a first chamber with at least one constriction, having a first port coupled to a first source of one or more gases, including means for controlling expansion of a plasma in said first chamber back through said first port,

one or more RF energy sources coupled to said first chamber,

means for dissociating said one or more gases in said first chamber into said plasma having a power density, wherein said at least one constriction increases said power density of said plasma in proximity to said at least one constriction, and

a second chamber coupled to said first chamber, wherein said second chamber can contain one or more articles, and said second chamber has an operating pressure above 200 milliTorr.

15. (original) The apparatus of claim 14, wherein said means for dissociating said one or more gases includes a first inductor coupling RF energy to said one or more gases in said first chamber.

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16. (original) The apparatus of claim 14, wherein said means for dissociating said one or more gases includes a first electrode and a second electrode to capacitively couple RF energy to within said first chamber for dissociating said one or more gases.

17. (original) The apparatus of claim 14, wherein said means for controlling expansion of said plasma in said first chamber back through said first port uses one or more small openings.

18. (original) The apparatus of claim 14, wherein said at least one constriction is provided by at least one removable insert.

19. (original) The apparatus of claim 18, wherein said at least one removable insert includes material that selectively reacts to release one or more elements into said one or more gases during dissociation of said one or more gases.

20. (currently amended) An apparatus to dissociate one or more gases to produce plasma, said apparatus comprising:

- a first chamber with a first constriction, having a first port coupled to a first source of one or more gases, including means for controlling expansion of a plasma in said first chamber back through said first port,

- a second chamber with a second constriction, having a second port coupled to a second source of one or more gases, including means for controlling expansion of a plasma in said second chamber back through said second port,

- one or more RF energy sources coupled to said first chamber and said second chamber, means for dissociating said one or more gases from said first port into a first plasma having a first power density in said first chamber, wherein said first constriction increases said first power density,

- means for dissociating said one or more gases from said second port into a second plasma having a second power density in said second chamber, wherein said second constriction increases said second power density, and

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a third chamber coupled to said first chamber and said second chamber, wherein said third chamber can contain one or more articles, and said third chamber has an operating pressure above 200 milliTorr.

21. (original) The apparatus of claim 20, wherein said means for dissociating said one or more gases includes a first inductor coupling RF energy to said one or more gases in said first chamber.

22. (original) The apparatus of claim 20, wherein said means for dissociating said one or more gases from said first port into said first plasma in said first chamber is different to said means for dissociating said one or more gases from second port into said second plasma in said second chamber.

23. (original) The apparatus of claim 20, wherein said means for dissociating said one or more gases includes a first electrode and a second electrode to capacitively couple RF energy to within said first chamber for dissociating said one or more gases.

24. (original) The apparatus of claim 20, wherein said means for controlling expansion of a plasma includes a material having one or more small openings.

25. (original) The apparatus of claim 20, wherein at least one constriction is created by at least one insert that is removable.

26. (original) The apparatus of claim 25, wherein said at least one insert includes material that selectively reacts to release one or more elements into said one or more gases during dissociation of said one or more gases.

27. (original) The apparatus of claim 20, wherein said first chamber and said second chamber supply said first plasma and said second plasma in parallel to said third chamber.

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28. (original) The apparatus of claim 20, wherein said first chamber and said second chamber supply said first plasma and said second plasma in series to said third chamber.